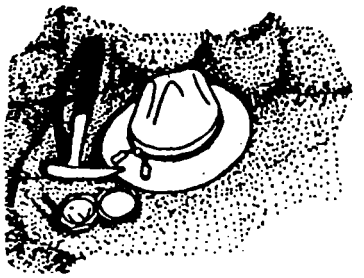
REGISTERED GEOLOGICAL ENGINEER (AZ)
CERTIFIED ENGINEERING GEOLOGIST (CA)

REGISTERED GEOLOGIST (CA, ME, MO)
REGISTERED CIVIL ENGINEER (CA, MA)



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ALLEN W. HATHEWAY, Ph.D.

US EPA RECORDS CENTER REGION 5

411769

File 131098
30 March 1999

Michael, Best & Friedrich, LLP
One South Pinckney Street
Madison, Wisconsin.
(608) 283-2275(F)

ATTENTION: David Crass, Esq.

SUBJECT: FINAL REPORT: Peer Review of Manufactured Gas Tar Calculations for Former Manufactured Gas Plant at Ashland, Wisconsin

On behalf of your client, Northern States Power Company (NSP), you have asked that I review certain data and calculations related to:

1) The affected natural media (soil, ground water and sediments) at the Ashland Lakefront Site, located in Ashland, Wisconsin (The Site), and;

2) The Amount of residual tar product estimated to have been produced by the Manufactured Gas Plant (MGP) formerly owned and operated by Lake Superior District Power Company (LDSP), on property now owned by NSP (The NSP Property).

I understand that the are two bodies of affected media at the Site. These are:

1) Wood-processing wastes placed, by others, as uncontrolled and unengineered fill and that such now present as an aquifer beneath Kreher Park, and;

2) Impacted near-shore sediments of a portion of the Chequamegon Bay.

3) At the NSP Property affected media include the ravine-fill aquifer as well as the deeper Copper Falls aquifer.

This understanding on my part has been developed through review of case reports developed by the Dames & Moore Group (Madison, WI) on the part of NSP and by SEH (Short Elliott Hendrickson) as supporting the Wisconsin Department of Natural Resources.

I am a tenured full professor of Geological Engineering, at the School of Mines & Metallurgy, at the University of Missouri-Rolla. My disciplines include geology, hydrogeology, the history of industrial waste, and the historic technical operational history of manufactured gas. I hold degrees through the doctorate in geology (UCLA, 1961) and geological engineering (University of Arizona, 1966 and 1971). I have been in practice for 38 years and am professionally licensed as a Geologist, Engineering Geologist, Geological Engineer and Civil Engineer in several States. I practiced professionally, at Los Angeles, San Francisco and Boston, with adjunct teaching appointments at the University of Southern California (Civil

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Engineering) and Boston University (Engineering Geology) before joining the University of Missouri faculty in 1981.

This letter report serves to transmit my findings in peer review of the manner of computational set-up, as well as the ensuing calculations related to estimation of the quantities of manufactured gas tar to be expected to have formed in the course of historic operation of the Ashland, Wisconsin Gas Works.

SCOPE OF WORK

You have asked that I provide opinions or responses to the following topics:

1) Peer review of calculations contained in the 4 December, 1998Dames & Moore Group letter report addressed to your attention, which contains an *estimation of the amount of MGP tar residuals produced over the operating life* of the LDSP MGP, as based on the information sources relied upon and available to Dames & Moore;

2) Peer-review the calculations made by the Dames & Moore Group, which have been offered to *estimate the amount of impacted media in the environment* now found, by explorations, at and below the Site and the NSP Property, and;

3) Peer-review the related calculations made by Short Elliott & Hendrickson (SEH), as contained in its *Remedial Action Options Feasibility Report* of December 1998.

EXECUTIVE SUMMARY

Based on my review of the above-noted data, and as further described below, I conclude the following:

1) Dames & Moore's calculations estimating the amount of tar product produced over the operating life of the LSDP MGP are as accurate as can be made, as based on existing evidence;

2) Dames & Moore's calculations estimating the amount of impacted-media, in the environment, at the Site and below the NSP Property are as accurate as can be made, as based on the existing evidence, and;

3) SEH's calculations and approach are misleading and likely underestimate the total volume of PAH-impacted media in the environment.

DISCUSSION

1) Premise No. 1: Dames & Moore's calculations regarding the amount of MGP tar residuals, produced over the operating life of the LDSP MGP are as accurate as can be made, as based on existing evidence.

   MGP experts traditionally rely on the voluntary reports of individual gas companies as they were submitted to the editors of *Brown's Directory of North American Gas Companies*, as fundamentally accurate data, unless otherwise indicated as being flawed, in comparison with other collateral parameters or other sources of information.

Dames & Moore's calculational approach, as outlined in its 4 December 1998 letter, has followed the present state-of-the-art method of computational setup and calculation of MGP tar residuals. Dames & Moore has made proper use of the available, fundamental technical and contemporaneously-recorded operational records of the MGP, as well as the reports made by the LDSP to Wisconsin Public Service Commission, and the voluntary reports submitted to the editors of *Brown's Directory*.

Dames & Moore has supported its calculational rationale by including appropriate footnotes related to specific sources and specific facts regarding the LSDP MGP.

Dames & Moore cites that the single year of production vs. sales statistics, as performed by WDNR, yields an overall 13-percent under-run difference with the quantities estimated by Dames & Moore. The amount of gas lost beyond the station meter traditionally were in the range of 3-10 percent, so that most gas plants suffered this loss of revenue. Whenever reported as gas sales, this loss of revenue, would therefore imply a short-fall in the quantities of gas actually generated, and with it, a short-fall in the amounts of tar residuals so produced. This discrepancy therefore drives the tar-generation estimated to be somewhat higher than would be calculable from a gas produced:tar residual ratio. On the other hand, amounts of tar sold should be accurate in the context of this issue.

Traditionally, tar was estimated as a yield per 10,000 cubic feet of gas produced, for it was more practical to track whole gallons rather than fractions of gallons (per generational unit of 1000 cf). Coal-gas production figures generally were computed, as a basis for consumer price deliberations by the Public Service Commission, at an average of 10 gallons of tar captured in the production of each 10,000 cf of gas.

I am therefore in agreement with the method and quantity estimations of Dames & Moore, as based on the highest degree of utilization of the most supportably-accurate calculational input data.

2) Premise No. 2: Dames & Moore's calculations estimating the amount of impacted media in the site-area environment (at the Site and below the NSP Property) are as accurate as can be made, as based on existing evidence.

The degree of site exploration carried on at the time of the computations was sufficient to define and delimit the impacted media. I have reviewed the computations set forth in the 4 December 1998 Dames & Moore Group letter and I agree with the estimated volumes of impact in the environment, as therein stated.

3) Premise No. 3: SEH's calculational approach is misleading and likely underestimates the volume of impacted media in the site-area environment.

I have reviewed Dames & Moore's criticism of the SEH tar-quantity estimates, as set forth in its 4 December 1998 letter, and agree with the comments made by Dames & Moore therein.

SEH has chosen to employ a more direct, but less scientifically and, therefore, less reliable method of estimating the total tar produced at the Ashland gas plant. It is my opinion that computations should be made from as reliable a data base as is available, and the Dames & Moore effort, which employs a state-of-the-art computation, follows this track and does not stray from use of original recorded data, as submitted by the gas plant management.

It appears that SEH used the presence and concentration of Benzo(a)pyrene (BaP) as a predictive parameter related to the overall presence of tar as a predictor of total tar volume. I do not believe that the basis for reference is reliable, given the vast opportunities for variance in the essential parameters of formation of carburetted water gas tars. There presently is no technical-historical basis for conversion of BaP presence to forms of master calculations of tar volume present in the environment.

Furthermore, site geology is somewhat complex, and I do not believe that the impressions that we have gained from the scattered exploration sampling represents a first-order base of data about what likely was created in the way of tar residuals, in the first place.

CONCLUSION

Based on the foregoing facts and opinions, I conclude that the Dames & Moore calculations are more accurate, reliable, and defensible of the information provided the Department of Natural Resources for use in its deliberations. I also opine that there are strong reasons to suspect differing sources of contamination, as present here and there in the affected media associated with the Site and with the NSP Property. These differences are consistent with other primary and secondary evidence of the presence of a wood-treatment operation historically present on the Site.

Please do not hesitate to be in touch should you have questions.

Yours truly,

Allen W. Hatheway

Allen W. Hatheway
Geological Engineer
SSAN: 564505224

Encls. 1) Resume
2) Coal-Tar Experience

RESUME of ALLEN W. HATHEWAY

EDUCATION

A.B., 1961, Geology	UCLA
M.S., 1966, Geological Engineering	University of Arizona
Ph.D., 1971, Geological Engineering	University of Arizona
Professional Degree, 1982, Geological Engineering	University of Arizona

PROFESSIONAL REGISTRATION

Geological Engineer:	Arizona	Geologist:	California, Maine, Missouri
Engineering Geologist:	California	Civil Engineer:	California, Massachusetts

EXPERIENCE

Since 1981 Professor, Geological Engineering, School of Mines & Metallurgy, University of Missouri - Rolla

Guidance and instruction of upper division and graduate students in environmental management and geotechnical options; exploration program design; hazardous and special waste management facility siting, design and permitting; site and waste characterization and remedial engineering for uncontrolled sites, seismic risk assessment; hazards mitigation; rock engineering and underground construction (predicting geologic conditions and development of variable site-condition clauses for full geotechnical disclosure); critical facility siting; expert testimony, trouble shooting, and elements of professional practice. Particular waste specialties include the general history of waste-producing industrial processes, waste disposal, laws and regulations; generic specialties in manufactured gas and coke sites, explosives and munitions, heavy metals, PCBs and dioxin.

He has applied these techniques to a wide variety of projects, including solid, special and hazardous waste management and cleanup, tunnels and underground openings, dams, reservoirs, highways, transmission lines and canals, nuclear and coal-fired power stations, surface mines, industrial plants, and urban geologic development projects in general.

Thirty-eight years of professional experience, including field mapping, photogeologic, and site exploration programs in 20 states, Canada, the Caribbean, South America, Southeast Asia, Korea, Persian Gulf, Turkey, Southern Africa, Norway, and western Europe.

Colonel, Corps of Engineers (Ret., Army of The United States); most recently assigned (1991) as Chief of Staff (mobilization), Ohio River Division (Cincinnati), and as one of ten Adjunct Faculty, National Defense University, Washington, DC. Also conceptor and former member of the U.S. Army Quick-Response Water-Finding Team for rapid-deployment operations.

1976 - 1981: Vice President & Chief Geologist, Haley & Aldrich, Inc., Cambridge, Massachusetts

Directed professional geologic staff; project management and technical guidance for hydrogeologic studies, waste management facility siting, rock structural evaluation, seismic risk assessment, and environmental service support for the full range of the firm's activities. From 1979 to 1981 also Adjunct Associate Professor of Geology, Boston University.

1969-1976: Practiced in Los Angeles and San Francisco, California

Geological engineer in Los Angeles; positions with LeRoy Crandall & Associates (now Law Engineers; as staff engineer), Geotechnical and Materials Engineering Branch, U.S. Forest Service (project engineer), and Woodward-Clyde Consultants (senior engineer). In San Francisco, as project geologist with Shannon & Wilson, Inc. From 1971 to 1974, taught geotechnical engineering at the University of Southern California, as Adjunct Assistant Professor of Civil Engineering.

1961-1969: Practiced in Arizona and in Washington State

1961-1963, Field Artillery Officer and Aerial Observer, 4th Infantry Division, U.S. Army. In 1964, soil laboratory technician (Arizona Highway Department) and engineering aide in rock mechanics instrumentation (U.S. Bur. Mines; San Manuel copper mine). 1965 to 1969, field mapping/drilling (Bear Creek, New Jersey Zinc Co., and Texas Gulf Sulfur) in Arizona and New Mexico.

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RESUME of ALLEN W. HATHEWAY

PROFESSIONAL SOCIETY MEMBERSHIPS

American Bar Association (Associate Member)
American Chemical Soc. (Div. Environmental Chemistry)
American Geophysical Union (Life Member)
American Society of Civil Engineers (Fellow)
American Society for Testing & Materials (ASTM)
American Underground Construction Association
Association of Engineering Geologists (Life Member)
Treasurer, 1982-1983; VP, 1984; President, 1985
Association of Ground Water Scientists and Engineers
Association of Soil & Foundation Engineers (ASFE)
Earthquake Engineering Research Institute
Geological Society of America (Fellow)
Chairman, Engineering Geology Div., 1980
Geological Society of London (Fellow)
International Association of Engineering Geology
International Society for Rock Mechanics
International Society of Soil Mechanics and
Foundation Engineering
Missouri Groundwater Assoc. (Charter Member)
Missouri Society of Professional Engineers
National Council on Public History
National Society of Professional Engineers
Society for Industrial Archaeology
Society of American Military Engineers
Society of Mining Engineers of AIME
Underground Technology Research Council
Western Association of Map Librarians

PUBLICATIONS

Geology and Engineering, 3d. ed., 1988, with Robert F. Legget; editor and major author of the 1988 AASHTO (American Association of State Highway & Transportation Officials) ***Manual on Subsurface Investigations;*** author, 1991 Corps of Engineers ***Geotechnical Field Handbook; Geophysical Methods for Hazardous Waste Site*** Characterization (with G.L. Hempen as Special Publicaion No. 3, Assoc. of Engineering Geologists; ***Bibliography of Engineering Geology*** (750-page ms in press, Association of Engineering Geologists) originator/editor, AEG Bulletin series ***Cities of The World*** (now 20 papers); 100 papers in engineering geology, environmental geology, hydrogeology, technical/regulatory history of waste management, waste management facility siting/design/cleanup, geotechnical engineering, rock engineering, tunneling, seismic risk, critical-facility siting, and professional practice.

HONORS

1966 - Sigma Gamma Epsilon, National Earth Science Honorary
1973 - California's Outstanding Young Civil Engineer; American Society of Civil Engineers
1973 - Society of The Sigma Xi, National Science and Engineering Honorary Society
1975 - Daniel W. Mead Prize; American Society of Civil Engineers
1981 - The Geological Society of America, E.B. Burwell Memorial Award
1988 - Meritorious Service Medal, U.S. Army (North Korean Invasion Tunnel Detection)
1989 - Certificate of Appreciation, Missouri Governor Ashcroft (Readiness Improvement, Missouri National Guard)
1989 - Meritorious Service Medal, U.S. Army, 1st Oak Leaf Cluster, (New Madrid Earthquake Response Planning)
1992 - Meritorious Service Medal, U.S. Army, 2nd Oak Leaf Cluster, (Environmental Remediation)
1994 - Floyd T. Johnston Award for Exceptional Service, Association of Engineering Geologists

SPECIAL STUDIES AND COURSES COMPLETED

1961 - U.S. Army Field Artillery Officer Basic Course, Fort Sill, OK
1963 - U.S. Army Special Operations Course, Fort Bragg, NC
1965 - U.S. Army Military Intelligence Officer Basic Course, Fort Holabird, MD
1976 - Association of Soil; & Foundation Engineers (ASFE) Institute of Professional Practice, for Design Professionals
1976 - U.S. Army Command & General Staff College, Fort Leavenworth, KS
1977 - U.S. Army Engineer Officer Advanced Course, Fort Belvoir, VA
1980 - U.S. Army War College, Carlisle Barracks, PA
1985 - U.S. EPA Hazardous Waste Health & Safety Training
1993 - U.S. OSHA **40-hour Hazardous Waste Health & Safety Training** (OHM Corp.)
1993 - General Employee Radiation Training (8 hr.), Weldon Spring Site Remedial Action Project
1994 - OSHA 8-hour Hazardous Waste Refresher Course (Jacobs Engineering Group, Inc.)
1995 - OSHA/DOE 18-hour Hazardous Waste Refresher Course (MK-Ferguson, Inc.)
1997 - OSHA/EPA 8-hour Hazardous Waste Refresher Course (Ecology & Environment, Inc.)

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RESUME of ALLEN W. HATHEWAY

PROFESSIONAL COMMITTEE ACTIVITIES

1977- 1982: ASCE Solid Waste Legislative Review Committee, Environmental Engineering Div.;
1979 - 1988: ASCE Committee on Environmental Concerns, Geotechnical Engineering Div.
1980 - 1988: AEG Seismic Safety Committee
1980 - Present: AEG Bulletin Series Editor and Creator: Cities of The World Series
1980 - 1986: National Sanitation Foundation Comm. (B32); Flexible Membrane Liners
1981 - Charter member, U.S. Natl. Committee for Engineering Geology; 1985-1986
1981 - 1986: ASCE Geotechnical Engineering Division Publications Committee
1983 - Chairman, Publications Committee, Engineering Geology Division, GSA
1983 - 1984: ASCE Environmental Engineering Div. Planner
1983 - 1986: Member, U.S. Natl. Comm. on Tunneling Technology, NAS/NAE
1983 - 1989: ASCE Hazardous Waste Committee (Environmental Engineering Div.)
1983 - Present: Member of Editorial Board, *Engineering Geology*, Amsterdam
1984 - 1985: American Geological Institute, Board of Directors
1985 - Panel Member, USEPA Science Advisory Board, Comm. on Environmental Engineering
1985 - 1986: Chairman, ASCE Environmental Engineering Div. Committee on Ground Water Quality
1986 - Chairman, Awards Committee, Engineering Geology Division, Geological Society of America
1987 - 1989: Member, 15-person Board on Earth Sciences, National Academy of Sciences
1988 - Chairman, GSA, Engineering Geology Division Centennial Awards Committee
1988 - 1989: Member, USNRC Comm. on Solid-Earth Sciences; Chairman, Geology, Land Utilization & Environment
1988 - 1993: Council on Health & Environmental Safety of Soils (CHESS); Chairman of Comm.. on Remedial Options
1989 - ASCE, Environmental Engineering Division, Subcommittee on Ground-Water Modeling (Manual of Practice)
1989 - National Research Council Working Party on Preservation of the Sphinx
1989 - 1991: Associate Editor, *Bulletin*, Geological Society of America
1990 - Member, AEG Committee on Ethics & Professional Practice
1991 - 1993 - Presidential Advisory Board, AEG
1991 - Present: Creator and Sole Director, AEG *Historical Archives*
1993 - 1995 - Present; Member ASCE Geotechnical Engr. Div., Subcommittee on Determination of Soil/Rock Permeability
1995 - Present: Member, Editorial Board, *Quarterly Journal of Engineering Geology*; Geological Society of London

TECHNICAL SHORT COURSES DIRECTED

1971 - U.S. Forest Service, Region 5 (California) week-long Geotechnical Course, Geologists & Engineers; Officer-in-Charge
1978 - Engineering Geology for Geologists, 1st AEG two-day short course, co-director/co-editor of published notes.
1982 - Symposium on Hazardous & Special Waste Management, St. Louis, co-director, for St. Louis Section, AEG
1982 - U.S. Army Corps of Engineers Basic Course in Engineering Geology, deputy director, 12 wk. (summer) UMR
1983 - U.S. Army Corps of Engineers Advanced Course in Engineering Geology, deputy director, Fall Semester, UMR
1985 - 1987: Office of Surface Mining, Field Engineering; co-director/instructor; 12 occasions, for 26 State Offices
1985 - 1987: USEPA national lecturer on Remedial Engineering at Hazardous Waste Cleanup Sites
1988 - U.S. Army Corps of Engineers Basic Course in Engineering Geology, Deputy Director, 12 weeks (summer), UMR.
1988 - U.S. Army Corps of Engineers Environmental Law and Regulation, Co-Director and Principal Instructor.
1989 - Allied-Signal Corp., Kansas City, MO, Environmental Regulation, Director and Principal Instructor.
1993 - Instructor in Pitfalls of Environmental Site Characterization, the E^3 Institute, Columbus, OH
1993 - U.S National Science Foundation - Environmental Geology for University Faculty (2-week course Instructor)

LISTINGS IN SCIENTIFIC & TECHNICAL ACHIEVEMENT DIRECTORIES

American Men & Women of Science
International Who's Who of Contemporary Achievement
Men of Achievement, Cambridge, UK (17th ed., 1995)
Personalities of The West & Midwest
Sterling's Who's Who Directory, Executive Edition
5000 Personalities of The World
Who's Who in American Education
Who's Who in Engineering
Who's Who in Frontier Science & Technology
Who's Who in Science & Engineering (3rd edition, 1996)
Who's Who in the Midwest (26th edition, 1998)
Who's Who in Technology (7th edition, 1996)
Who's Who in The World

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Allen W. Hatheway

MANUFACTURED GAS PLANTS & OTHER COAL-TAR SITES

Areas of expertise:

- o History of FMGP and coke plant production technologies and waste management practices
- o Site and waste characterization
- o Plant-specific historical-technological assessments
- o Assessment of effect of plant operation on today's residuals
- o Selection of remedy
- o Remedial engineering
- o Peer reviews
- o Regulatory interfacing
- o Expert testimony and litigation support

General Personal Data Base:

Personal library on the subject of FMGPs and former coke plants; technology of production, residuals management and geologic and waste conditions at specific plans and remedial engineering case history data.

Author of an unpublished proprietary, 510-page *Chronological History of Manufactured Gas, Coke & Accessory Coal-Tar Processes*, comprehensive proprietary collection of factual data relating to factors essential in site and waste characterization and remedial engineering; especially useful for multiple-use coal tar sites (Outline format).

Compilation of *Bibliography of Manufactured Gas & Coke, 1667-1997:* Unpublished proprietary manuscript, 321 p., under continuous revision and addition.

Compilation of a 200-page, proprietary, chronological technical and historical assessment of eleven FMGPs, a coke works, five tar distilleries, and numerous gas producers, in St. Louis and St. Louis County, Missouri.

Compilation of *Missouri Town Gas Plants*: Unpublished proprietary listing containing 120 pages of researched historical details of location, dates and nature of operation of 84 Missouri FMGPs and coke plants.

Compilation of *Chronologic History of Industrial and Hazardous Waste Management*: Unpublished proprietary listing of 985 p. of factual data in outline format.

Compilation of *Bibliography of Industrial and Hazardous Waste Management*: Unpublished proprietary manuscript of 640 p.

Specific expertise:

Peer review of site and waste characterization of the former Cicero Gas Company carburetted water-gas plant at Oak Park, Illinois (since Jan 1999).

Review of technical and operating history of the Laconia Gas Light & Coke Company, Laconia, New Hampshire former manufactured gas plant (FMGPs) in terms of the nature and extent of its released hazardous waste (1999).

Legislative commentary on special-funding for redevelopment of Hartford, Connecticut waterfront for sports stadium and urban renewal (1998).

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MANUFACTURED GAS PLANTS & OTHER COAL-TAR SITES

Review of technical, historic operating history and site geologic and waste conditions at 16 former manufactured gas plants (FMGPs) in Michigan (1999).

Peer review commentary related to calculation and differentiation of off-site migration of manufactured gas residuals at Ashland, Wisconsin, in comparison and contrast with those likely related to a nearby historic wood treatment facility (1998-1999).

Review of evidence presented to suggest that coal-tar residuals were suddenly and accidentally released to the subsurface, in the post-operational period at as many as 37 former manufactured gas plants in northern California, operated largely from 1852 through 1952 (1997).

Review of evidence gathered to suggest that ownership and construction of Interstate 5, at Sacramento, California (1963) in landtaking from major utility caused migration of coal-tar residues from former manufactured gas plant operated 1871-1957 (1997).

Historical site operational and waste generation and management assessment for the historic manufactured gas plant of the Sacramento Gas & Electric Company (1998).

Historical site operational and waste generation and management assessment for four historic manufactured gas plants of Illinois; Belleville, Champaign-Urbana, Galesburg and Hillsboro, Illinois (1997).

Historical site operational and waste generation and management assessment of the former manufactured gas plant at Concord, New Hampshire (1997).

Review of site/waste characterization efforts at Clinton, Missouri. Carburetted water-gas plant (1885-1930); Especially in terms of dispute resolution over conduct and adequacy of *Removal Site Evaluation* under CERCLA (1996-1997).

Preliminary characterization of gas producer (1878-1930) for PPG glass ovens at Crystal City, Missouri (1995).

Preliminary site and waste assessment of the 1853-1945 former manufactured gas plant (1995) of Peoria Gas Light & Coke Co., now Central Illinois Lighting Co. (CILCO; 1995).

Litigation support for Iowa DOT defense of alleged environmental impairment at Burlington, Iowa, site of an 1856 FMGP discovered as migrated wastes during 1991 construction of caisson foundations new Mississippi River Bridge; settlement reached on terms held favorable by IDOT.

Technical consultant for litigation over alleged third-party involvement in site of Kirksville Gas Light & Electric Co. plant (1905-1944), Kirksville, MO.

Presently (since 1994) lead consultant for development of remediation plan for the abandoned Carondelet Coke Works (1915-1987) in St. Louis, Missouri, starting with cost-recovery strategy and extending forward from Site Investigation through conceptual remediation concept.

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MANUFACTURED GAS PLANTS & OTHER COAL-TAR SITES

Review of 54 FMGP sites in Missouri, including discovery or erroneous determination of three sites (USEPA Radian Report, 1985) and discovery of additional 16 previously undetected FMGP sites.

Review of site, historical and potential waste conditions at more than 30 former manufactured gas plants (FMGPs) in Iowa (6), Kansas (5), Illinois (6), Arkansas (1), Oregon (3) and Montana (7).

Computation of nature and probable quantities of hazardous waste produced by Tiffany-patented oil-gas works, Portsmouth Naval Shipyard, Kittery, NH, throughout its life (1875-1905).

Critical regulatory review of report of closure of FMGP at Columbia, Missouri, in which cursory historic review did not disclose presence of a tar-accumulation system, which considering leakage, represented a serious overrun of estimated quantities of coal-tar residue taken off-site via *Expedited Removal* for treatment and secure landburial.

Construction feasibility review of Allied-Signal (B&V WST; Apr94) *Construction Oversight Plan for Goldcamp Disposal Area, Remedial Design/Remedial Action, Ironton,, Ohio* (Site of former coke works).

Applicable Coal-Tar Reference Citations:

Hatheway, A.W., 1996 (in press), Remediation of Manufactured Gas Plants and Other Coal Tar Sites; A Technical Handbook (Contract with Marcel Dekker for completion and delivery 1 July 1999).

Hatheway, A.W., 1999 (in press), Technical History of Manufactured Gas in California (1852-1940); Basis for Remedial Activities: Practice Periodical in Hazardous, Toxic and Radioactive Wastes, v. __, no. __, p. ___-___.

Hatheway, A. W, 1999 (abs.), Standard of Care in Site and Waste Characterization for Remedial Engineering of Uncontrolled Hazardous Waste Sites: Programs and Abstracts, Invited paper, Symposium on Professional Practice, 1999 Annual Meeting, Assoc. of Engr. Geologists, Salt Lake City, UT, p. ___-____.

_____, 1997 (in press), Estimated number of manufactured gas and other coal-tar sites in the United States: Env. & Engr. Geol., v. 2, no. __, p. ___-___.

Hatheway, A.W., 1999 (in preparation), Historic Coal Carbonization Industry of St. Louis, Missouri: *Missouri Historical Review* Missouri Historical Society, St. Louis, Missouri:

Part I: Gas Lights and Heat for St. Louis (1847-1950)

Part II: Industrial Coal Gasification at St. Louis (1880-1950)

Part III: Coal Chemical Industry of St. Louis (1847-1950)

Part IV: Carondelet Coke Works (1914-1987), with Richard A. Fernandez, and H. Philip Leighly.

MANUFACTURED GAS PLANTS & OTHER COAL-TAR SITES

_____,1997, Coal tar residuals; Don't let them embarrass you!: *Perspectives*, no., 29, a quarterly column (Since 1989) dealing with technologies and issues of professional practice of engineering geology: *AEG News*, Association of Engineering Geologists: v. 40, no. 2, Spring, 1997, p. 26-31.

_____, 1997, Manufactured Gas Plants; Yesterday's pride, today's liability: Civil Engineering Magazine, Nov, p. 38-41.

_____, 1996, Review; *Never Let the Lights Go Out* (Videotape history of manufactured gas): Atlantic Environmental Services, Colchester, CT, by J. Ripp, R.R. Kroehling and D. Hardy, 30 minutes, Env. & Engr. Geosciences, v. 2, no. 4, p. 613-614 (An assistance to site and waste characterization by geologists).

Hatheway, A.W., 1999 (in preparation), Guide to the technical literature of manufactured gas and coke as a basis for geologic site and waste characterization and engineered remediation: Env. & Engr. Geosciences, v. 1, no. __, p. ___-___.

Hatheway, B.A., and Hatheway, A.W., 1997 (in preparation) Unexpected Coal-Tar Wastes; The Forgotten Legacy of Industry, 1870-1930: For the *Military Engineer*; A Five-Part Series Dealing with Manufactured Gas, Gas Producers, Producer Gas Engines, and Wood Preservation Wastes Found at Military Installations, Arsenals, Explosives and Munitions Plants and Naval Yards:

Part I:	Manufactured Gas in American Industry (1860-1930)
Part II:	Producer Gas Engines in American Industry (1870-1930)
Part III:	Gas Producers in American Industry (1880-1930)
Part IV:	Wood Preservation in American Industry (1880-1930)
Part V:	Recognizing Manufactured Gas Residues at Military Installations, Arsenals and Naval Yards (1830-1960)
Part VI:	Remediation of Manufactured Gas Residues at Military Installations, Arsenals and Naval Yards.

Hatheway, 1995, Dealing with Missouri's Coal Tar Sites: Preprint of invited paper presented at 1995 Annual Meeting, Missouri Ground Water Association, Section of National Ground Water Association, Held at Cape Girardeau, MO, 21 Feb, 5 p.

Hatheway, A.W., 1993, Site Chronology of Former Manufactured Gas Works, Burlington, Iowa, 1856, 1993, Unpublished proprietary manuscript, 93 p.

Hatheway, A.W., 1993 (Abs.), Former Manufactured Gas Plants - The Ideal Means of Teaching Hazardous Waste Site Characterization and Remediation: Submitted for 1993 Annual Meeting, Assoc. of Engr. Geol., San Antonio, TX, 1 p.

Hatheway, A.W., and Anderson, D.R., 1993 (Abs.), Engineering Geology and Industrial Technology Applied to Remediation of Manufactured Gas Plant Sites: 1993 Annual Meeting, Assoc. of Engr. Geol., San Antonio, TX, 1 p.

Hatheway, A.W., and Anderson, D.R., 1993 (Abs.), Former Manufactured Gas Plants of Missouri; 19th Century Enigmas of Today's Site and Waste Characterization: Abs. and Prog., Annual Meeting, North-Central Sec., Geological Soc. of America, Rolla, MO, 1. p.

Hatheway, A.W. and Anderson, D.R., 1993, Some Generalizations about the Character of Former Manufactured Gas Plants and their Wastes and Waste Disposal Practices: Handout prepared and circulated at 1993 Annual Meeting, North-Central Sec., Geological Soc. of America, Rolla, MO, 4 p.

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